SECTION 2
CM LIFE CYCLE MANAGEMENT AND PLANNING

	QUESTIONS THIS SECTION WILL ANSWER:	Para.
1.	What management activities comprise the CM Process; how are they related?	2.2, 2.2.1, 2.2.2, 2.2.3
2.	What Government CM Manager's management activities are part of the process?	2.3, 2.3.1 - 2.3.5
3.	What should be considered in the planning for each phase? When should planning take place?	2.4 (Figs. 2-6 through 2-9)
4.	What is appropriate content for Government CM plans?	Appendix A
5.	What information is prerequisite to effective planning and what is the source of that information?	2.3.1
6.	What is the relationship between Government and Contractor CM planning and management?	2.3.1, 2.3.3
7.	What information needs to be provided to contractor(s) to facilitate contractor planning and to establish economical common information interfaces?	2.3.1, 2.3.2
8.	What information does the Government need to obtain from contractors related to CM planning and implementation?	2.3.3, 2.4
9.	What are the appropriate Government CM activities, and actions to be performed in each phase? What are the criteria for performing them? What are the objectives and benefits?	2.4
10.	What training is required?	2.3.2
11.	What are the methods that can be used to assure that contractors apply effective CM processes?	2.3.3
12.	How should the Government evaluate Contractor CM processes and planning? What are the keys to look for?	2.4
13.	How can process assessment rather than inspection result in reliable consistent CM?	2.3.3
14.	How can the Government evaluate its own CM performance?	2.3.3
15.	Why are continuous assessment and improvement necessary?	2.3.4
16.	What is the benefit of lessons learned? How should they be documented?	2.3.4

2.1 General

A basic principle of management is that responsibility, unlike authority, can not be delegated. The Government Activity [1] and especially its Configuration Manager[2] have the responsibility to ensure that the operating forces are provided with correctly "configured" hardware, software, and the information necessary to operate and maintain them effectively. Regardless of the acquisition concept employed, this responsibility cannot be delegated, nor can it be taken lightly.

The documentation acquired by the Government and the degree of Government detailed involvement in configuration change decisions varies with the acquisition approach being utilized. In the past, contractual imposition of a CM military standard assured that a contractor employed CM practices, and could be held accountable through audit, oversight and other surveillance methods. The Government typically assumed control of configuration documentation in three progressive stages (Functional, Allocated, and Product baselines). The

[1] Government activity responsible for buying, managing, and sustaining the systems and items of hardware and software,

[2]The person(s) responsible for ensuring that the CM process is successfully executed for those systems and items is hereinafter referred to as the Configuration Manager or CM manager.

control consisted of Government CCB approval of any Class I Changes and Government concurrence in Class II changes **[Details Section 4]**, typically by DCMC[3] representatives. By assuming direct control of the baselines the Government could prevent changes that were not beneficial, could not be supported, or were too costly. The Government configuration manager fulfilled his responsibility through a great deal of hands-on management and detailed decision making.

To reduce the cost of weapon system acquisition, relieve the cost premium on contractors for doing Government business, facilitate a common commercial/Government industrial base, and solve the problems relating to equipment obsolescence, Government acquisition practices were revised to adopt industry practices and to include acquisition based primarily on performance specifications. In a performance based acquisition, the Government controls only the specified performance and the critical interfaces of the item, leaving the design solution and its implementation to the contractor. **[Details Section 3]** Only where absolutely necessary will the Government assume configuration control of the product baseline (the design solution). **[Details Section 4]** In addition, there will be no military standard CM requirements or practices with which a contractor must comply. The industry standard for CM, EIA-649 is a guidance document which cites CM principles and best practices; each design activity is required to establish, document and execute a CM process that addresses the CM principles and practices that are applicable to their products. MIL-STD-2549 provides requirements relating only.to the interfaces that must exist for information transactions.

This new approach relieves the Government configuration manager of the burden of much of the hands-on configuration change control processing of change proposals at the detailed design level, described above, but it does not relieve his/her responsibility to the operating forces. The changes in acquisition methods and strategies have no changed the activities to be accomplished as part of the configuration management process.

Given the differences in acquisition concept, and the variations which will occur from program to program, the CM responsibility must be fulfilled using flexible, adaptive and mature management methods. Planning and management techniques are the key to effective implementation of CM. This section describes management activities including planning for, and selecting the key actions to implement (and measure the effectiveness of) configuration identification, control, status accounting and audit, throughout the program life cycle. In describing these key actions, the interfaces to be established and the information needed to perform the actions are identified.

Acquisition methods and strategies often drive the determination of the degrees and levels to which Government and contractor configuration management is applied. There are many options which must be determined during the planning and preparation for an acquisition phase, and definitized in the contract language. This section provides rationale, based on benefit to risk considerations, to help in making appropriate choices.

Implementation concepts and details are referenced by pointers to specific supporting information found in **Sections 3 through 7** (which reflect the major CM functions) and Appendices which support them. For example, Contents of a Government CM plan are delineated in **Appendix A**. The reader is encouraged to use Section 2 as the home base, from which to return after looking up specifics in other sections or appendices.

2.2 Management and Planning Concepts

This section contains a description of the CM process that is shared by both the Government and its contractors; its relationships with the systems engineering and logistics management processes; and the management relationships and activities to be applied across the life cycle.

2.2.1 CM Functional Activity

Figure 2-1 is a top level CM activity model to be used as a reference point to plan and implement the major CM activities (functions) over the program life cycle. **[Lower level details are covered in this Section and in**

[3] Defense Contract Management Command

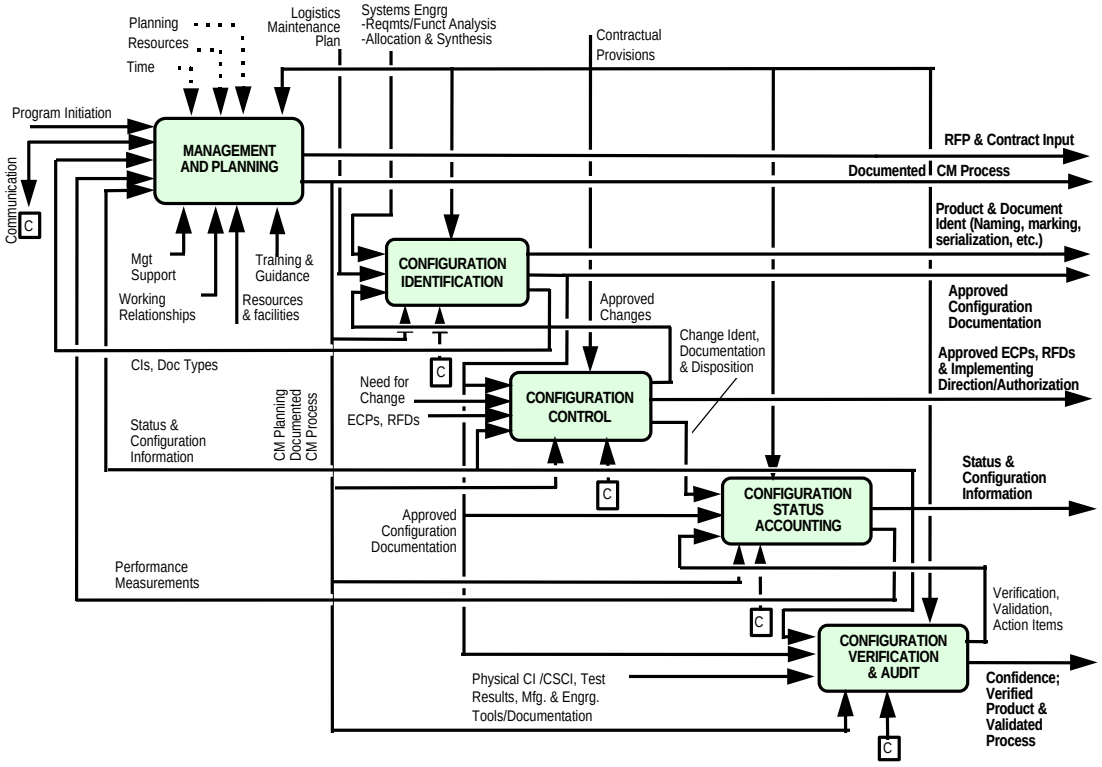


Figure 2-1. Top level Configuration Management Activity Model

Sections 3-7.] It provides an overview of the entire CM process from the Government's perspective and illustrates the relationships within the process. As with all the activity models in this handbook, the format of the model is based on the IDEF0 convention. It shows the inputs (left); outputs (right), constraints (top), and implementing tools or methods (bottom) for each functional CM activity (represented by rectangular boxes).

a. <u>Management and Planning</u> - This block represents the core Government CM activity and its relationships to the other activities. Inputs to Management and Planning consist of the authorization to initiate the CM Program, communications with all of the other CM activities, and selected information and performance measurements received from the status accounting activity.The activity is facilitated by the degree of management support provided, the working relationships established with such other interfacing activities as Government Program Management, Engineering and Logistics, contractor Configuration Management and DCMC. It is further facilitated by the resources and facilities assigned to the function including such resources as automated tools, connectivity to a shared data environment, and other infrastructure elements. Integrated Product and Process Development (IPPD) and the use of Integrated Product Teams (IPTs) by the Government and contractor facilitate the interaction and communications between all parties involved in a common CM process. The training and experience of the personnel and the guidance and resources they have at their disposal are also facilitators.

The Management and Planning process may be constrained by a compressed time schedule for program execution, by a lack of needed people and tools, or by a lack of effective planning. It may also be constrained by contractual provisions which limits the Government CM manager's sphere of control.

The outputs from this activity consist of CM planning informaion and the resultant documented CM process which determine the extent of allocation of the CM functional activities to the contractor and the Government. The need to perform the CM activities, described below, is independent of any specific organizational structure, whether composed of IPTs or conventional functional organizations. The outputs from this Activity also include statement of work language and other information to be inserted in Requests for Proposals and Contracts. If either

Government or contractor configuration management finds itself constrained by contract restrictions, it indicates ineffective planning and coordination of requirements or lack of success in gaining management approval for proposed contract language. **[Details Sections 2.3, 2.4]**

b. Configuration Identification - This activity provides the foundation for all of the other Government CM functional activities. Facilitated by the documented CM process and by open communications, this activity interacts with system engineering **[See 2.2.2]**. Through contractors, IPTs and other means, it provides approved configuration documentation **[Details Section 3]** to document the physical and functional characteristics of the system/item, establishes baselines for Government and contractor configuration control, creates records in the status accounting data base and provides documentation for configuration verification and audit. In addition, product and document identifiers (nomenclature and numbering) are an important output from this activity."

Contractors are expected to have a robust configuration identification activity to define and baseline configuration documents and items at all levels, some of which may transition to Government configuration control depending upon applicable contract provisions. **[Details Sections 3 and 4]** Although not specifically shown in **Figure 2-1**, the data management activity, concerned with the identification, version/revision control, electronic access to, and distribution of all product information, is implicitly related to this activity. **[Details Section 7]**

c. Configuration Control - The Government configuration control process receives input from Configuration Identification defining the current configuration baseline. It receives and processes requests for engineering changes from Government technical, operational and contracts functions, and it receives Engineering Change Proposals and Requests for Deviations from contractors. It also receives requests for modifications to fielded items and facilities from DoD organizational units.

The configuration control activity is constrained by contractual provisions which determine the types and levels of documentation subject to Government configuration control authority. It is facilitated by communications, the documented CM process and by information obtained from the status accounting data base as needed. The CSA information includes the current implementation status of approved changes and other pertinent information concerning the configuration of items in design, in production and in the operational inventory.

This activity may communicate requests for documentation of engineering changes to contractors. It subsequently provides for the review and approval/disapproval of proposed of changes, and for the necessary authorization and direction for change implementation by contractors and affected Government activities. It provides input to status accounting about change identifiers, about the progress of the change documentation through the steps in the configuration control decision/authorization process, and about the implementation status of authorized changes.**[Details Sections 4 and 5]**

d. Configuration Status Accounting (CSA) - All of the other CM activities provide information to the status accounting data base as a by-product of transactions that take place as the functions are performed. Limited or constrained only by contractual provisions and aided or facilitated by the documented CM process and open communications, this activity provides the visibility into status and configuration information concerning the product and its documentation.

The Government CSA information is maintained in a CM data base that is compatible with the interface requirements of MIL-STD-2549. **[Details Section 5]** This database will include such information as the as-designed, as-built, as-delivered, or as-modified configuration of any serial-numbered unit of the product as well as of any replaceable component within the product. Other information, such as the current status of any change, the history of any change, and the schedules for and status of configuration audits (including the status of resultant action items) can also be accessed in the data base.

Metrics (performance measurements) on CM activities are generated from the information in the CSA data base and provided to the Management and Planning function for use in monitoring the process and in developing continuous improvements. To the extent that contractor and Government data bases and processes are integrated, the Government CM Manager may also be able to monitor contractor performance trends.

e. Configuration Verification and Audit - Inputs to Configuration Verification and Audit (Functional and Physical Configuration Audit) include: schedule information (from status accounting), configuration documentation (from configuration identification), product test results, and the physical hardware or software product or its representation, manufacturing instructions, and the software engineering environment. Outputs are verification that (1) the product's performance requirements have been achieved by the product design and (2) the product design has been accurately documented in the configuration documentation. This process is also applied to verify the incorporation of approved engineering changes. Configuration verification should be an embedded function of the contractor's process for creating and modifying the product. Process validation by the Government in lieu of physical inspection may be appropriate.

Successful completion of verification and audit activities results in a verified product and documentation set that may be confidently considered a Product Baseline, as well as a validated process that will maintain the continuing consistency of product to documentation. **[Details Section 6]**

2.2.2 Relation to Systems Engineering Process

Configuration Management is a key element in the System Engineering process, as illustrated in **Figure 2-2** because the System Engineering Process governs the product development and addresses all aspects of total system performance.

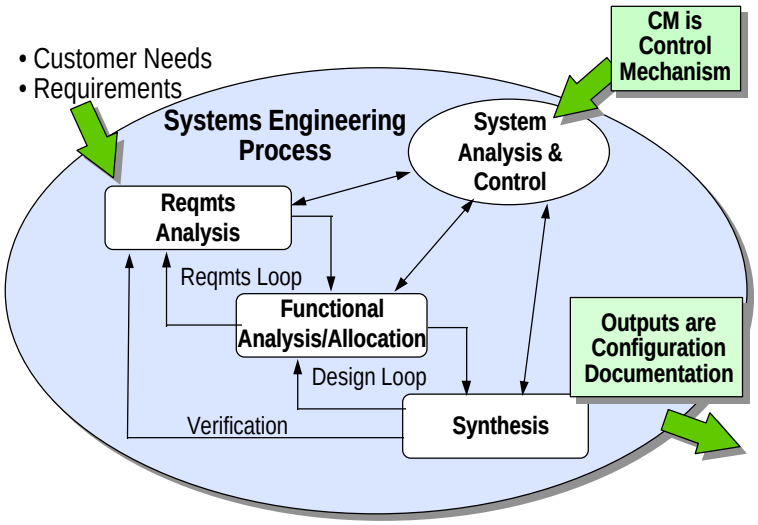


Figure 2-2. How CM Relates to Systems Engineering

In general the system engineering process is associated with operational analysis, requirements definition and design determination. It includes defining the interfaces internal and external to the system including hardware-to-hardware, hardware-to- software and software-to-software interfaces. The tools of system engineering, typically exercised in an integrated product team environment, include:

- **Requirements analysis** - used to determine system technical requirements, and to provide verifiable performance-based requirements in the system utilization environments, and the top level functional requirements that the system must meet.

- **Functional Analysis and Allocation** - integrates the functional system architecture to the depth needed to support synthesis of solutions for people, products, processes, and management of risk. It is conducted iteratively to define successively lower level functions; the lowest level yields a set of requirements that must be performed by components of the system to meet the top level requirements.

- **Synthesis** - commonly understood as preliminary and detailed design, translates the functional and performance requirements into a description of the complete system that satisfies the requirements.

As shown in **Figure 2-2**, the system engineering process uses the "requirements loop" and "the design loop" in an iterative analytic approach to make operational, requirements and design decisions at successively lower levels. As this process iterates, requirements are defined, documented, and approved within the CM process in the form of performance specifications for the Functional baseline, and for the Allocated baselines for specific components of the system identified as configuration items (CI). **[Detail: 3.3]** Outputs of the system engineering process also include the basis for drawings and/or data sets that are released to produce the item and, after verification/audit, form the Product Baseline. Thus system engineering is the process that produces the technical information for which the CM process provides technical control. As the CM process generates requirements for changes, the System Engineering process is exercised to define the technical basis for the change.

2.2.3 Relation to Logistics Process

Also related to systems engineering and a strong component of the Integrated Product Teams is the Acquisition Logistics activity. Support and Maintenance planning, begins prior to Engineering and Manufacturing Development within each IPT and is iterated throughout the life cycle as changes in design and item performance dictate. A significant output of this process is the maintenance plan which articulates the maintenance concept for each item that requires support. Coordination with the logistics planning in general, and with the maintenance planning, in particular, is essential to Configuration Management planning and implementation as illustrated in **Figure 2-3.**

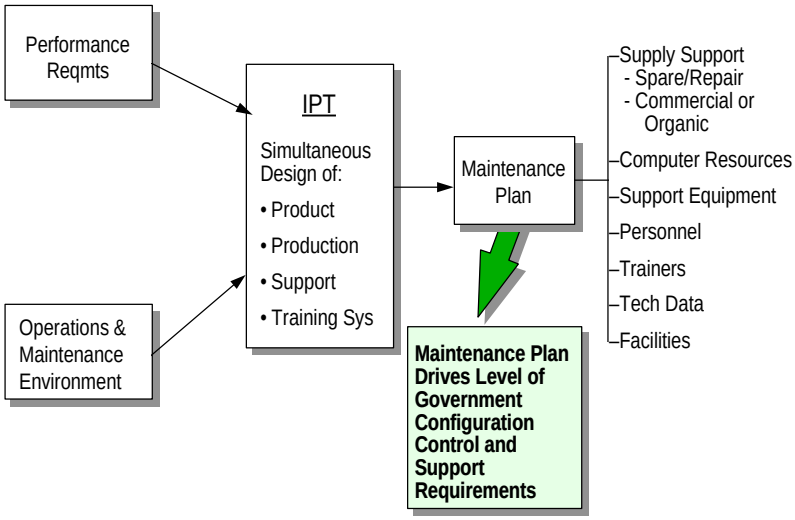


Figure 2-3. How CM Relates to Logistics

The maintenance concept defines many of the factors that must be addressed in a mature logistics system. The maintenance plan is highly dependent on system/component reliability and on volatility of the technology used in the item design. These factors (and many others) are used to determine how the items, which constitute the system/component, will be supported, e.g. throw-away or repair, and commercial or organic repair. The level of items that the Government decides to stock as replacement spares is the major influence on the level of Government configuration control. The maintenance plan includes the life cycle requirements for personnel, training, facilities, support equipment, supply support, and training devices, and influences the information elements that may have to be provided to fully document an engineering change. **[Details Section 4]**

The goal for the Government is to create the proper mix of Government organic support and original equipment manufacturer (OEM) support. The support approach should maintain the desired configuration (form, fit, function, and interface), facilitate tracking of fielded units, provide necessary spares, meet contingency requirements, maintain the technical data, and provide upgrades and improvements that enhance system availability and lower life cycle cost. The lowest equipment indenture level at which the maintenance concept determines that organic

replacement is required, and for which the Government must order spares, determines the lowest level at which the Government needs to obtain performance and over which the Government will exercise Government configuration control. **[Details Section 4]**

2.3 Government Management and Planning Activities

The Government's Management and Planning activities are common to all phases of the program life cycle, although the details upon which that management activity focuses varies from phase to phase. The global activities are illustrated in **Figure 2-4** and described below. The details upon which they focus are described in the CM templates **[See 2.4]**, and in referenced supporting paragraphs in this section, **Sections 3-7**, and **appendices**.

2.3.1 Preparing for the Next Phase

During each phase of the program life cycle, preparation for the following phase takes place. For concept exploration phases this work takes place prior to the initiation of the conception phase, when the requirements for funded study efforts are being formulated.

CM planning is a vital part of the preparation for each phase. CM Planning consists of determining what the CM concept of operation and acquisition strategy for the forthcoming phase will be and preparing or revising the Government's Configuration Management Plan **[Details Appendix A]** accordingly. Configuration Managers must envision future phases and determine what information in the current and immediately following phase must be captured to meet the needs of those future phases.

The CM concept of operation answers questions such as:

- What are the CM objectives for the coming phase?
- What is the rationale for these CM objectives?
- How is each CM objective related to program objectives and risks?
- What is the risk associated with not meeting the objectives?
- How can achievement of the objectives be measured?
- What information is required to support the Government CM goals for the next phase? Future phases?
- How can that information best be obtained?

The CM acquisition strategy addresses the roles and responsibilities of the Government CM activities and the contractor CM activities by answering such questions as:

- What are the deliverables from the next program phase?
- Which deliverables are configuration items? Will contractors propose candidate CIs? How will the final listing of Cis be officially designated?
- What is the end use of each CI?
- How are they to be supported?
- To what extent will they be supported by the Government? By the manufacturer?
- To what level are performance specifications required? CIs? Repairable components? Replaceable components?
- Will the Government prepare performance specifications, or will contractors?
- Who in the contractor organization will be responsible for approving the performance specifications? In the Government organization?
- What level of configuration documentation (e.g. performance specifications, detail specifications, complete technical data package) will be required by the Government by the end of the next phase? By the Contractor?
- What kinds of configuration identifiers (e.g., part numbers, serial numbers, nomenclature, National Stock Numbers) will be required by the Government by the end of the next phase? By the contractor?
- Which baselines (and documents) will already be subject to Government Configuration Control at the start of the next phase?
- What baselines will be established by the contractor during the next phase?, Functional?, Allocated?, Product?

- What documents need to be included in those baselines?
- Will control of any of the baseline documents transfer from the contractor to the Government during the next phase? When is the transfer planned to occur?
- What status accounting will be needed in the next phase?
- Which specific subpackets of information (see the Data Information Packets and Appendix A in MIL-STD-2549) should be provided by the Government? By the contractor?
- Does the program have approval to obtain the information in other than digital format? Will the Government need to have on-line access?

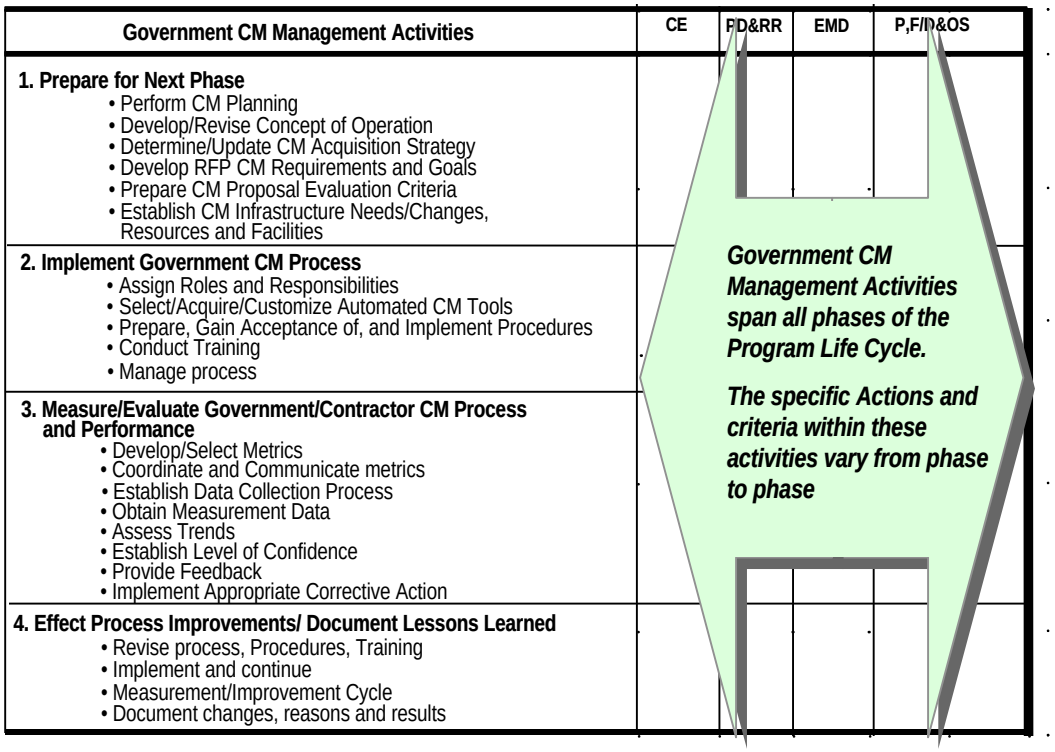


Figure 2-4. Implementation of "Global" Government CM Management Activity

Obviously these questions can not and should not be answered in isolation. They require close coordination, preferably in a teaming atmosphere involving Government Program, Engineering, and Logistic personnel. Where feasible it is desirable to work out planning for future phases within a teaming arrangement with the contractor or contractors participating in the current phase. This provides an opportunity to examine all perspectives on the critical issues and goals in an open atmosphere, and to arrive at an optimum approach.

In addition to enabling the Government CM manager to complete his CM plan, the answers to these questions also provide a rational basis for developing and coordinating configuration management and data management requirements to appear in requests for proposal, and in formulating the criteria to be used to evaluate proposals submitted by contractors. The RFP should be compatible with the Government's CM Plan, however the CM Plan should have sufficient flexibility to enable the CM strategic goals to be met with a variety of responses from contractors.

The RFP also must send the message to the contractor's that the Government is serious about configuration management. It is also one of the best opportunities for the Government CM manager to establish an environment in which contractor CM will have the support of its management. The proposal evaluation criteria (Section L of the RFP) should have Configuration Management as a key management and past performance discriminator. Its weighting should reflect the significance that an effective, documented contractor CM process can have as a risk mitigator.

Preparation for the next phase is not complete until the Government CM Manager determines, and gains commitment for, the resources and facilities that will be needed to implement the Government's CM process. The infrastructure requirements must be adequate to support the program in accordance with the CM concept of operation, and acquisition strategy. The goal is to perform a credible risk analysis in developing the concept of operations which will provide convincing evidence to justify theinvestment in the CM process by showing that the investment will be returned many fold as a result of reduced costs for technical and logistic problems.

2.3.2 Implementing the Government CM Process

During each program life cycle phase, the Government CM Manager implements the planned CM Process. **[Details 2.4]**

The process definition, initiated in the CM planning activity prior to the phase, is now completed by preparing procedures and coordinating them with all participants in the process. Neither Government, nor contractor Configuration Management can be accomplished effectively without the participation and cooperation of many different functional activities. There is no single CM function that does not involve at least two or more interfaces. To accomplish the CM goals requires "team play". One of the best ways to achieve team play is to provide the vision, and solicit cooperative constructive input on the details of the implementing procedures. Each functional area must understand the particular roles and responsibilities that they have in the CM process. The tasks that they are to perform must be integrated into their work flow and given high priority. Coordinating the procedures is the initial step.

Any changes in the Government infrastructure necessary for the performance of CM during the phase are accomplished and tested, including the installation of appropriate automated tools and their integration with the data environment. Personnel from all disciplines and/or integrated product teams are then trained in the overall process and in the specific procedures and tools which they will use. Training pays dividends in a smooth seamless process in which personnel, who understand their roles and the roles of others with whom they interface, work cooperatively treating each interfacing player as a "customer".

Once all of these elements are in place, managing the CM process in the environment of performance based acquisition, IPTs and allocated configuration control authority, still remains a challenging enterprise. The individual IPTs, contractors and other Government activities who are the authority for configuration control of segments of the product design must apply consistent logic to their decision making, and must provide information that can be shared in the common data environment. Once a well thought out plan, and a documented and agreed-to process are in place, the Government CM Manager must employ modern management techniques to assess process effectiveness, assure anticipated results, and fine tune the process as necessary. It is also necessary to maintain the process documentation by updating plans, procedures and training, as required.

It all starts and ends with communication:

- Articulating clear goals and objectives
- Making sure that the various players understand and cooperate
- Providing frequent feedback
- Assuring that current status information, needed to complete process steps, is accessible, and
- Paying attention to the inevitable minor problems which surface.

2.3.3 Measuring/Evaluating Government/Contractor CM Process

Both the Government and the contractor CM process are measured and evaluated using metrics, program reviews, and other means such as Contractor Performance Assessment Reviews (CPARS). Each template in **Section 2.4** provides typical CM objectives for each phase, and typical metrics that may be selected to determine the degree to which those objectives (CM goals) are being met. The objectives help to focus the measurement on the most meaningful and important parameters; the metric presentation provides a level of confidence in the process being measured. Objective oriented metrics should be collected throughout the progress of the entire phase or at least

until the stated objectives are realized. **Figure 2-5** illustrates that CM objectives are related to the Program activity and Program objectives for each phase of the life cycle.

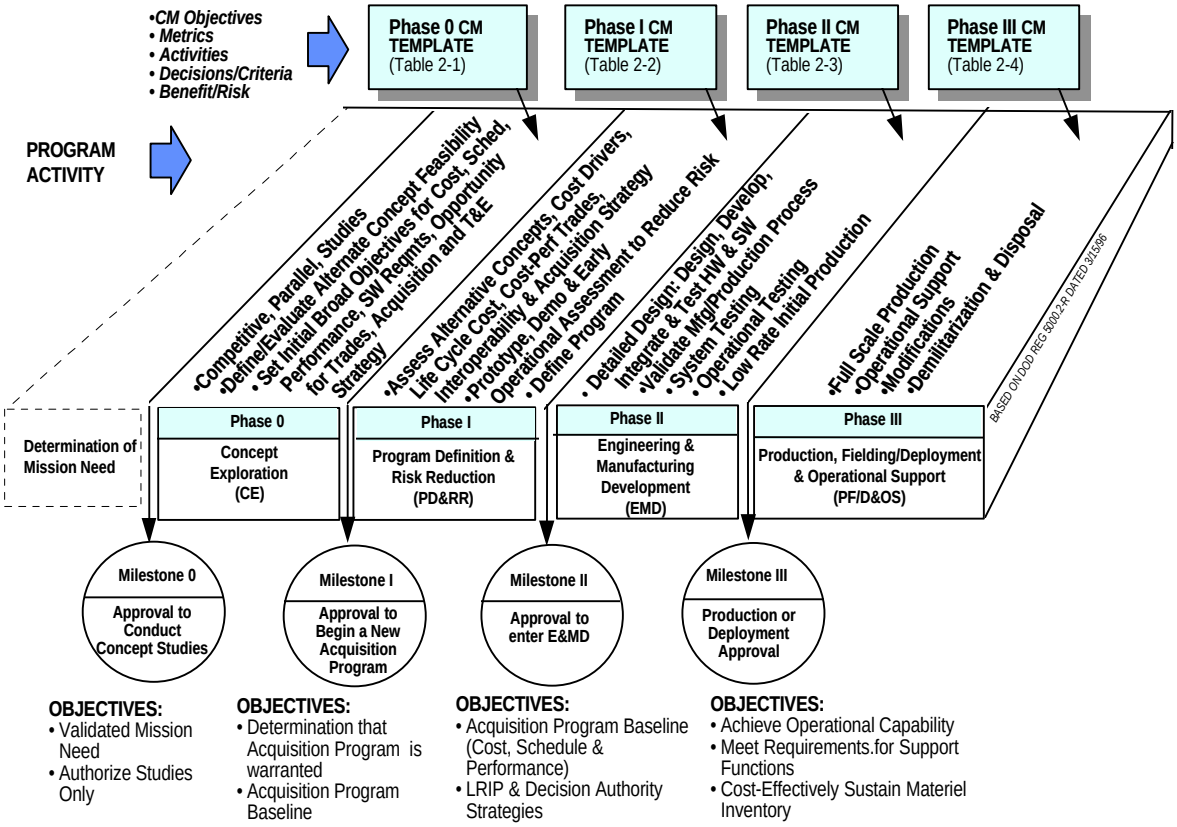


Figure 2-5. CM Objectives for each Phase are Keyed to Program Objectives and Activities

Since the CM Process is a shared enterprise, the Government CM objectives and the Contractor CM objectives should be congruent. The best way to do that is to communicate. During the CM planning for each phase, the Government must articulate the vision and the contractor must realize the seriousness of the intent. The Governments CM objectives should be made available to the contractor(s) for comment before being finalized. The Contractor's CM objectives should be provided to the Government for review as part of the contractors proposal. The ensuing dialog can set the stage for effective CM implementation. Since the DCMC will be the agency to interface with the contractor most directly on metrics and performance measurement issues, they should be involved as a full team member. Ideally, a common set of objectives should be agreed upon by all.

Metrics are key to continuous process improvement. Metrics constitute the data for improvement, i.e. the facts of the process. They enable problems that need attention to be quantified, stratified and prioritized and also provide a basis for assessing the improvements, and assessing trends. A properly constituted set of CM metrics supports both the CM goals and process improvement. Only a few critical items should be used at one time. They should be designed to positively motivate, rather than keep score, and should be forward focused (where are we going) not merely a compilation of past history.

CM by its very nature is cross functional. No important CM function is performed without interaction with other functional or team members. Therefore, CM objectives and measurements cannot and should not be divorced from the interacting systems engineering, design engineering, logistics, contracting and other program objectives and processes. Moreover, it is not the efficiency of CM activities, per se, that add value, but their result in contributing to overall program objectives.

Improving either the Government or industry CM process is a venture that typically requires interaction across a broad spectrum of program activities including technical, financial and contractual. The process must be documented to a level of detail that is:

- Easily understood by all participants in the process
- Focused on the key process interfaces
- Less detailed than the procedures used to perform the process but sufficient to determine what must be measured to obtain factual information on the process.

A metric involves more than a measurement; it consists of:

- An operational definition of the metric which defines what is to be measured, why the metric is employed, when, where and how it is used. It can also help to determine when a metric has outlived its usefulness and should be discontinued.
- The collection and recording of actual measurement data. In the case of the CM process, this step can often be accomplished by query to the status accounting data base, which normally can provide a great deal of process flow information
- The reduction of the measurement data into a presentation format (e.g., run chart, control chart, cause and effect diagram, Pareto charts, histogram) to best illuminate problems or bottlenecks and lead to the determination of root cause or largest constraint.

An effective metric has the following attributes:

- It is meaningful in terms of customer relationships (where the “customer” can be any user of information that is provided.)
- It relates to an organization’s goals and objective, and tells how well they are being met by the process, or part of the process, being measured
- It is timely, simple, logical and repeatable, unambiguously defined, economical to collect.
- It shows a trend over time which will drive the appropriate forward focused action which will benefit the entire organization.

2.3.4 Effect Process Improvement & Document Lessons Learned

We learn from effective measurements and metrics if the process is or is not meeting objectives. We also learn which part of the process is currently the biggest contributor to detected backlogs, bottlenecks, repeat effort, or failures/errors. By focusing on that weakest link, we can isolate the problem and trace it to its root cause. Often the cause can be corrected by streamlining the process (eliminating redundancy or non-value adding steps, modifying sequence, performing tasks in parallel rather than in series) or improving communications. Measurements should continue as is or be altered to fit the new solution for a period of time sufficient to assess if the revised process is resulting in improved performance. This measurement/improvement cycle is an iterative process. Once a weak link is improved, the process metrics are again reviewed to determine and improve other parts of the process which stand out as contributors to deficiencies or lengthy cycle time.

The key personnel involved in the process must be participants in defining the improvements. Their “buy in” is essential if the improvements are to be implemented effectively. Detailed procedures and effected automated systems must be modified and personnel must be re-trained, as required. These “total quality management aspects” of the job are best performed as an integral part of the process of managing, rather than as isolated exercises. It is also foolish to expend effort in improving processes without clearly documenting the lessons learned to leverage the efficiency of future applications Changes made in the process, over time, should be recorded along with the reasons the changes were made and the measured results. A suggested place to record process changes is in the configuration management plan. Initially the CM plan was a projection of the expected implementation of configuration management over the program life cycle. As a minimum, it is updated during each phase for application during the next. Including process change and lessons learned information makes the plan a working document reflecting the transition from anticipated action (planning) to completed action (reality). It can then

serve as a better reference to use in planning for the next program phase and in the initial planning for future programs.

2.4 CM Implementation over the Program Life Cycle

This section consists of a series of templates, one for each life cycle phase, which collectively provide a road map for the CM process. The templates **(Tables 2-1 through 2-4)** portray CM objectives, typical metrics, activities, actions, benefits and risks, decisions to be made and criteria for making them. Actions are cross-referenced to descriptive detail in **Sections 2 through 7.**

Table 2-1. CM Template for Phase 0, Concept Exploration

CM Objectives	Typical Metrics
Government ♦Access to current versions of study reports ♦Defined acquisition strategy and Government CM plan **Both Government and Contractor(s)** ♦Clear coordinated plans for the Program Definition and Risk Reduction (Phase I) **Contractor(s)** ♦Defined CM Process for PD&RR Phase	Checklist of applicable actions to be completed in this phase **[See Table 2-1A]**

ACTIVITY: Management and Planning, Phase 0			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦Develop concept of operation and acquisition strategy for CM in Phase I, Program Definition and Risk Reduction ♦Prepare, coordinate and release procedures implementing Phase 0 Government CM Process; conduct training. (See Govt. activities below.) ♦Measure/evaluate contractor CM process **Contractor and Government** ♦Prepare and coordinate configuration management plans for Phase I ♦Define digital data interface and data requirements for Phase I ♦Document lessons learned during Phase 0. **Contractor** ♦Prepare, coordinate and release procedures to implement contractor CM support of systems engineering during Phase 0; conduct training. (See activities below) ♦Develop Phase I CM requirements, information/data and metrics to be negotiated with potential subcontractors	2.2.3, 2.3.1, Appx A 2.3.2 2.3.3 2.3.1, Appx A, 5.2, 5.3, Sect. 7 2.3.4 1.1, 1.3.1, 2.2.2, 2.2.3, EIA Std 649 2.3.3, Sect 4, 5.2, 5.3, Sect. 7	♦Determine the methods to be used to record and internally control functional, performance and requirements information during Phase I. ♦Determine the unique identifier structure to be used for documentation and products during phase I and succeeding phases ♦Consider the CM information needs of the following phases and develop a time phased approach to its collection and dissemination	♦**Benefit:** - The appropriate level of resources and the right information to efficiently and effectively conduct CM in Phase I ♦**Risks, if not done:** – Incompatible Government and Contractor CM Systems – Inadequate or excessive resources – Inability to perform effectively for lack of timely information

ACTIVITY: Configuration Identification, Phase 0			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government • Implement identification method and review process to review concept exploration studies and draft RFP material. **Contractor and Government** ♦Participate in Program Management and Systems Engineering IPTs **Contractor** ♦Maintain a defined document identification and release process for systems engineering products such as concept study and associated reference documentation. ♦Establish audit trail of decisions and document iterations	3.6.1, 7.2.1 .2.2 .6.1, 3.7.1, 7.2, .2.1-7.2.6, .3.1	♦Table 3-10. Document Identification ♦Table 3-12. Engineering Release ♦Fig. 7-3 Generic Document Identifier Characteristics ♦Decision traceability method	♦**Benefits:** – Efficient management of information – Access to correct, current data – Effective information-sharing among IPTs and between Government and Contractor ♦**Risks, if not done:** – lack of an audit trail of decisions – Incorrect revisions used – IPTs may not be working to a common reference

Table 2-1. CM Template for Phase 0, Concept Exploration, Continued

ACTIVITY: Configuration Control, Phase 0			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Contractor and Government ♦ Establish process for version control of concept study data files and document representations ♦ Implement common process to review and coordinate iterations of concept evaluation data	7.2.1-7.2.5 7.2.4	♦ Degree of formality of the change process ♦ Approval and implementation authority ♦ Process flow.	♦ **Benefit:** – Efficient review – Assure that all functional groups or integrated product teams are working to a common reference ♦ **Risks if not done**: – Inconsistent, unreliable, analyses, reports, conclusions
ACTIVITY: Configuration Status Accounting, Phase 0			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Contractor and Government ♦ Record and report status of management and technical decisions including designation of individual IPTs responsible for their implementation ♦ Provide traceability of all decisions to revisions in study documents and requirements documentation ♦ Issue unique identifiers for the digital data files and document representations of each document and each hardware model or software package released for use on the program	5.2 7.2.3	♦ Use of a common system/data base by Government and contractor ♦ Capture points in work flow for data attributes ♦ Data access privileges	♦ **Benefits:** – Single information source – Always current reference – Common basis for decision – Access for all with a need to know ♦ **Risks if not done**: – Lack of decision audit trail – Redundant document storage – Decisions based on obsolete data
ACTIVITY: Configuration Audit, Phase 0			
Configuration Audits are not applicable in Phase 0.			

Table 2-1A. Operational Definition of Phase 0 Metric - Checklist of Actions

Metric Title: **Checklist of Phase 0 Actions**	**Process Owner:** Government and Contractor CM Managers
Description (including Data Source, Measurement Method, Frequency): This metric tracks the completion of the actions necessary in Phase 0. It requires a specific selection of the actions listed in Table 2-1, which apply for the product, environment, contractual requirements and CM Planning.	**Data Presentation:** Tabular checklist (See below)
Purpose/Desired Result: Measure completion of Phase 0 activities	**Linkage to Objectives:** This metric links to all Phase 0 Objectives

✓	*CONTRACTOR ACTIONS*	✓	*GOVERNMENT ACTIONS*
	• Using Table 2-1as a guide, tailor a list of specific contractor actions applicable to the program • Assess the completion of Phase 0 actions and the acceptability of resultant processes/information		• Using Table 2-1as a guide, tailor a list of specific Government actions applicable to the program • Assess the completion of Phase 0 actions and the acceptability of resultant processes/information

Table 2-2. CM Template for Phase I, Program Definition And Risk Reduction

CM Objectives	Typical Metrics
Both Government and Contractor(s) ♦ Clear coordinated plans for the EMD Phase ♦ Functional configuration documentation finalized and ready to be baselined **Government** ♦ Define alternative performance requirements with comparable associated life cycle cost, interoperability, and risk assessment data ♦ Access to associated current versions of risk reduction studies and test reports ♦ Defined acquisition strategy and Government CM plan **Contractor(s)** ♦ A defined set of performance requirements (meeting cost and schedule constraints) as a basis for EMD proposal/contract ♦ Defined CM Process for EMD Phase ♦ Major subcontractor performance requirements defined ♦ Subcontractor CM planning for EMD defined and evaluated	1. Checklist of applicable actions to be completed in this phase **[See Table 2-2A]** 2. Evaluation of draft performance documentation (System and top level CI Performance specifications) in terms of: • Identified performance and interface requirements that track to DoD Acquisition Program performance thresholds • Associated verification requirements (to demonstrate the ability to meet or exceed thresholds) defined. • Analysis and modeling data that confirms a high probability of meeting defined requirements **[See Table 2-2B for Operational definition of metric]**

ACTIVITY: Management and Planning, Phase I

Actions:	Ref:	Decisions/Criteria	Benefits/Risks
Government			
♦ Develop concept of operation and acquisition strategy for Phase II CM	2.2.3, 2.3.1, Appx A	♦ Applicable levels of configuration item identification and control for EMD based on program supportability strategy	♦ **Benefit:** The appropriate level of resources and the right information to efficiently and effectively conduct CM in the EMD Phase
♦ Prepare, coordinate and release procedures implementing the Government CM Process for Phase I; conduct training. (See Govt. configuration identification, control and status accounting activities below.)	2.3.2		♦ **Risks, if not done:** – Incompatible Government and Contractor CM Systems – Inadequate or excessive resources – Inability to perform effectively for lack of timely information – Inappropriate baselines and loss of configuration control – Excessive configuration documentation ordered that is not necessary for Phase II program
♦ Measure/evaluate contractor CM Process	2.3.3	♦ Consider the CM information needs of the following phases and develop a time phased approach to its collection and dissemination	
Contractor and Government			
♦ Prepare and coordinate configuration management plans for EMD Phase	2.3.1, Appx A		
♦ Define digital data interface and data requirements for Phase II	5.2, 5.3, 7.3.2		
♦ Document lessons learned during Program Definition and Risk Reduction	2.3.4		
Contractor			
♦ Prepare, coordinate and release procedures to implement the contractor CM Process for Phase I; conduct necessary training. (See contractor configuration identification, control and status accounting activities below.)	1.1, 1.3.1, 2.2.2, 2.2.3 EIA-649		
♦ Develop EMD Phase CM requirements including information/data and metrics to be negotiated with subcontractors	2.3.3, Sect. 4, 5.2, 5.3, 7.3.2		

Table 2-2. CM Template for Phase I, Program Definition And Risk Reduction, Continued

ACTIVITY: Configuration Identification, Phase I			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Establish interface Memoranda of Understanding with associated Government programs/commands, as applicable ♦ Implement identification method and release process for Government requirements and directive documentation. ♦ Review System/Top Level CI Performance Specifications for alternative system solutions **Contractor and Government** ♦ Jointly participate in Program Management and Systems Engineering Integrated Product Teams **Contractor** ♦ Internally control requirements for alternative solutions through a defined document release and control process ♦ Establish requirements traceability from top level to allocated requirements definitions ♦ Prepare, review and provide System and Top Level CI Performance Specifications to the Government ♦ Capture configuration definition of simulation software, prototypes and engineering models through release and control of configuration documents. ♦ Establish interface agreements and Interface control working groups (ICWGs) for interface management.	3.8.1 3.6.1, 3.7.1 2.2.2 3.7.1 3.4.1, 3.4.2 3.7.1, 3.7.2 3.8.1, 3.8.2	♦ Table 3-10. Document Identification (Identification method for simulation software, test articles, prototypes, computer models, etc.) ♦ Fig. 7-3 Generic Document Identifier ♦ Table 3-12. Engineering Release - determine release procedure for requirements documents, test plans, test reports, analyses, trade studies, risk analyses, etc. ♦ Select requirements traceability method or tools ♦ If the program involves more than one Government activity, what should the command relationship or interface methodology be? ♦ If the program involves more than one contractor (or contractor team), what should the contractual or interface relationships be?	♦ **Benefits:** – Efficient management of information – Access to correct, current data – Effective information-sharing and coordination among various IPTs and between Government and Contractor ♦ **Risks, if not done:** – Poor correlation between requirements documents and test results – Incorrect revisions used – IPTs not working to a common reference – Inaccurate, incomplete interface data – Inability to assess requirements iterations on interfaces
ACTIVITY: Configuration Control, Phase I			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Implement process to review and coordinate changes to Government requirements definition **Contractor and Government** ♦ Establish an appropriate minimal configuration control process for program performance based requirements being defined and evaluated during this program definition phase. ♦ Maintain Government requirements definition **Contractor** ♦ Implement common process to review and coordinate changes to evolving configuration ♦ Maintain control of requirements definition documents or data bases	4.1.1 4.1.1 4.1.1	♦ Levels of requirements documentation to place under control ♦ Degree of formality of the change process ♦ Approval and implementation authority ♦ Timing transition to new requirements after making decisions. ♦ Process flow.	♦ **Benefit:** – Efficient review of changing requirements both at contractor and between contractor and Government – Assure that all functional groups or integrated product teams are working to a common reference as changes occur ♦ **Risks if not done**: – Inconsistent, unreliable, analyses, tests, simulations, reports

Table 2-2. CM Template for Phase I, Program Definition And Risk Reduction, Continued

ACTIVITY: Configuration Status Accounting, Phase I			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government and Contractor ♦ Record and report the current performance requirement documentation ♦ Correlate definition of simulation software, prototype and or engineering model configurations to applicable test results, analyses, and trade studies ♦ Record and report status of proposed requirement changes including the status of incorporation into the work scope of individual IPTs. ♦ Record all authorized changes to requirements documentation ♦ Access traceability of requirements from the top level documentation through all subordinate levels identified in Phase I ♦ Provide controlled access to the digital data files and document representations of each document and software item released for use on the program	5.2	♦ Table 5-1. Typical CSA Information Over the Life Cycle ♦ Table 5-2 CSA Tasks ♦ Use of a common system/data base by Government and contractor ♦ Capture points in work flow for data attributes ♦ Data access privileges	♦ **Benefits:** – Single information source providing consistency – Always current reference – Common basis for change decision – Access for all with a need to know ♦ **Risks if not done**: – Redundant document storage and retrieval – Costly searches for information and status – Improper decisions made based on obsolete data
ACTIVITY: Configuration Audit, Phase I			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Typically, configuration audits are not applicable in Phase I. If determined necessary for critical elements in test or demonstration articles such as flight test demonstrators, tailor the audit actions from the Phase II Audit activity.			

Table 2-2A. Operational Definition of Phase I Metric - Checklist of Actions

Metric Title: **Checklist of Phase I Actions**		**Process Owner:** Government and Contractor CM Managers	
Description (including Data Source, Measurement Method, Frequency): This metric tracks the completion of the actions necessary in Phase I. It requires a specific selection of the actions listed in Table 2-2, which apply for the product, environment, contractual requirements and CM Plans of the program		**Data Presentation:** Tabular checklist (See below)	
Purpose/Desired Result: Measure completion of Phase I activities		**Linkage to Objectives:** This metric links to all Phase I Objectives	
✓	***CONTRACTOR ACTIONS***	✓	***GOVERNMENT ACTIONS***
	• Using Table 2-2 as a guide select a tailored list of specific contractor actions applicable to the program • Assess the degree of completion of Phase I actions and the acceptability of resultant processes/information		• Using Table 2-2 as a guide select a tailored list of specific Government actions applicable to the program • Assess the degree of completion of Phase I actions and the acceptability of resultant processes/information

Table 2-2B. Operational Definition of Phase I Performance Threshold Metric

Metric Title: **Ability to achieve DoD Acquisition Program Baseline Performance Thresholds**	**Process Owner:** Government/Contractor Program Managers
Description (including Data Source, Measurement Method, Frequency): This metric tracks the Acquisition Program Baseline performance thresholds, which are the minimum performance requirements to be met for the program to be able to proceed to the next phase. (There are also cost and schedule thresholds.) **[Ref: DoD Regulation 5000.2-R]** It identifies defined performance requirements which meet or exceed each of the thresholds. It provides a level of confidence by citing the evidence demonstrating the capability to meet the defined requirements through computer modeling, simulation testing (e.g., wind tunnel), analysis, prototype/breadboard testing, prior history, or other means.	**Data Presentation:** Tabular listing of: ♦Performance thresholds ♦Quantitative statement of defined performance requirements (which meet or exceed thresholds) and reference to where defined. ♦If and How Capability to meet the defined requirements is demonstrated (with reference to objective or subjective data
Purpose/Desired Result: Provide the correlation between the Phase I objectives and the documented and demonstrated achievement of those objectives	**Linkage to Objectives:** This metric links directly to the primary objectives of Phase I, which are to define the performance based program requirements meeting performance, cost and schedule thresholds with the least risk

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development

CM Objectives	Typical Metrics
Government ♦ Effective Government CM process in place ♦ Confidence in Contractor(s) CM process ♦ Functional baseline established and under Government configuration control for Systems/Subsystems ♦ Allocated baselines established and under Government configuration control for top level CIs and other CIs whose performance requirements are to be controlled by the Government during this phase ♦ Product baselines established and under Government configuration control for CIs whose detail design is to be controlled by the Government ♦ Government CSA data base established with data content (data elements and relationships) appropriate for EMD and the Production, Fielding/Deployment and Operational Support Phase ♦ All data requirements for phase III defined and negotiated **Both Government and Contractor(s)** ♦ Performance specified and allocated ♦ Documented performance achieved and verified ♦ Joint Functional Configuration Audit completed per plan ♦ Defined and verified product configuration ♦ Allocated and Product baselines under appropriate configuration control authority ♦ Contractor CSA can provide required data meeting Government conceptual schema (data elements and relationships)**[Ref: MIL-STD-2549]** **Contractor(s)** ♦ Documented and Validated CM process in place ♦ Allocated baselines established and under Contractor configuration control for CIs whose performance requirements are to be controlled by the Contractor ♦ Design documentation and changes controlled via an effective release system ♦ Verification activities including Functional and Physical Configuration Audits, when required, completed per plan. ♦ Product baselines established and under Contractor configuration control for CIs whose detail design is to be controlled by the Contractor ♦ Contractor status accounting data base operational with data content (data elements and relationships) appropriate for both EMD and the Production, Fielding/Deployment and Operational Support Phase.	♦ Checklist of CM actions to be completed prior to each major development event for the system and each CI, as applicable, e.g.: – Functional Baseline – Allocated baseline(s) – CI/CSCI Integration – Significant Operational or Flight Tests – Functional Configuration Audit – Physical Configuration Audit **[See Table 2-3A for operational definition of metric.]** ♦ ECP Cycle time (may be stratified by $ value or complexity factors, ECP Priority codes or ECP Justification codes) **[See Table 2-3B for metric operational definition of metric.]** ♦ Rate of Class I ECP Approval **[See Table 2-3C for operational definition of metric.]** Contractor CCB Government CCB ♦ Number/Percentage of Deviation Requests **[See Table 2-3D for operational definition of metric.]** ♦ Number of Configuration Audits planned, held, successfully completed (all actions); Open actions remaining per audit. **[See Table 2-3E for operational definition of metric.]** ♦ Change Incorporation Rate - Volume of un-incorporated (unverified) engineering changes vs target for test articles and low rate initial production units. **[See Table 2-4B for operational definition of metric.]**

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Management and Planning, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Develop concept of operation and acquisition strategy for Phase III CM ♦ Prepare, coordinate and release procedures implementing Phase II Government CM Process; conduct training. (See Govt. activities below.) ♦ Measure/Evaluate Contractor CM Process	2.2.3, 2.3.1, Appx. A 2.3.2 2.3.3, 3.1.2, 4.1.2, 5.3, 6.3	♦ Applicable levels of CI item identification and control for Phase III based on program supportability strategy. See Fig. 2-3. ♦ Table 3-1. Config. Ident. Process Eval. Checklist ♦ Table 4-1. Config. Ctrl. Process Eval. Checklist ♦ Table 5-2. CSA Process Eval. Checklist	♦ **Benefit:** – The appropriate level of resources and the right information to efficiently and effectively conduct CM in Phase III ♦ **Risks, if not done:** – Incompatible Government and Contractor CM Systems – Inadequate or excessive resources – Inability to perform effectively for lack of timely information – Loss of configuration control – Poor supportability – Excessive configuration documentation ordered that is not necessary for program management or sustainment
Contractor and Government ♦ Prepare and coordinate configuration management plans for Phase III ♦ Define digital data interface and data requirements for Phase III ♦ Effect process improvements and document lessons learned during Engineering and Manufacturing Development	2.3.1, Appx A, A.2.1, A.2.2 5.2, 5.3, Sec 7 2.3.4	♦ Table A-2 Government CM Plan ♦ Table A-3 Contractor CM Plan ♦ Consider the CM information needs of Phase III and refine approach to its collection and dissemination	
Contractor ♦ Prepare, coordinate and release procedures to implement the contractor CM Process for Phase II; conduct necessary training. (See contractor configuration identification, control and status accounting activities below.)	1.1, 1.3.1, 2.2.2, 2..2.3, EIA Std 649		
♦ Finalize Phase III CM requirements including subcontractor information/data and metrics	2.3.3, 3.1.1, 4.1.2, 5.3, 6.3 2.3.3, 5.2, 5.3, Sects. 4 & 7	♦ Tables 3-1, 4-1, 5-2 (See above)	
ACTIVITY: Configuration Identification, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Approve System Specification establishing Functional Baseline ♦ Concur with contractor specification types ♦ Approve top-level and lower-level CI performance specifications for which the Government has configuration control authority, establishing a (Government) Allocated Baseline for each CI For CIs for which Government is configuration control authority at detail design level, establish (Government) Product Baseline (after CI performance verification and documentation/product consistency).	3.4.1, 3.4.2, 3.5.1, 3.5.2	♦ Table 3-2. CI Select. Crit. ♦ Fig. 3-3. Selection. of. Specification Types ♦ Table 3-3. Order of Precedence for Specs. ♦ Table 3-4. Spec. Types Categorized by Source ♦ Table 3-5. Spec. Types Categorized by Utility ♦ Table 3-6 Spec. Types Categorized by Object ♦ Table 3-7. Spec. Types Categorized by Purpose	♦ **Benefit:** – Known structure (hierarchy) of system/CI to which configuration documentation and other information is related – Performance, interface and other attributes are clearly documented – Items are identified and marked at an appropriate level – Identification of product

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Configuration Identification, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
		♦Table 3-13 Govt Acq. of Detailed design Data	and documentation are modified as significant changes are incorporated
♦Assign Nomenclature, where appropriate	3.6.3	♦Table 3-11. Item Ident.	– Release of configuration documents is control led and configuration baselines are established and maintained
♦Assign representatives, establish and operate Interface Management Boards or other mechanisms to coordinate contractual and technical interface issues among related Service Components and Commands	3.8, 3.8.1, 3.8.2	♦Table 3-14. Doc. Defining Interfaces ♦Table 3-15. Interface Mgmt. Process Matrix	
♦Participate in Contractor ICWG activity		♦Fig. 3-6. Interface Mgmt. Process Flow	– Configuration documentation, user, and maintenance information correlate to product versions
Contractor and Government			
♦Determine configuration control authority for configuration documentation for each CI, based on maintenance and support plans and CM plans.	3.1, 4.1.1.1 2.2.3	♦Fig. 2-3. How CM Relates to Logistics	♦**Risks, if not done:**
Contractor			– Incomplete documentation
♦Define product structure identifying CIs and configuration documentation	3.2, 3.2.1, 3.3, 3.3.1, 3.3.2	♦Table 3-2 Tiering of CI Designations	– Inadequate or incorrect product identification and marking
♦Assign CI Identifiers/Nomenclature			– Inconsistency between product and documentation
♦Determine type of specification(s) for each CI (See Criteria for Types & Order of Precedence)		♦Fig. 3-3, Tables 3-3 through 3-7	– Inability to validate performance and interface attributes
♦Assign specification identifiers	3.6.1, 3.6.2	♦Table 3-10. Doc. Ident.	– Inability to distinguish between product versions
♦Define interfaces using ICWGs/ICDs as applicable	3.8, 3.8.1, 3.8.2	♦Table 3-14, Table 3-15, Fig. 3-6.	– Inadequate basis for defining changes and corrective actions
♦Prepare and coordinate CI specifications, obtain approval by all affected functional organizations and teams	3..5, 3.5.1, 3.5.2	♦Table 3-9. Software Documentation ♦Figs 3-4a.-e. Baseline Concepts	– Configuration control authorities not established or defined inappropriately
♦Approve CI performance and/or detail specification for each CI for which contractor has configuration control authority, establishing a (Contractor) Allocated Baseline			– Uncertain configuration control decisions
♦Assign part/item and software identifiers	3.6.3	♦Table 3-11. Item Identification	– Inability to provide efficient product support after production and deployment
♦Define traceable items and prescribe method of tracking identification (serial or lot control)			
♦Release engineering design data (Engineering drawings, computer models, software design documents)	3.7.1, 3.7.2	♦Table 3-12 Eng. Release Rec. Content & Funct.Cap .	
♦Maintain design release baseline (also referred to as developmental configuration and release record) and baseline for each software version	3.5.1, 3.5.2	♦Table 3-8. Eng. Dwgs. & Associated lists	
♦For CIs for which the contractor is the configuration control authority at the detail design level, establish (Contractor) Product Baseline (after verifying CI performance and CI documentation/product consistency).	3.1, 4.1.1.1 6.1, 6.2, 6.2.1	♦Fig. 3-4 a.-e. ♦Fig. 6-2. Change Implementation & Verification	

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Configuration Control			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government			♦ **Benefits:**
♦ Establish Government configuration control process and procedures for Phase II, including Change Initiation, Evaluation, and Disposition.	4.1, 4.1.1	♦ Fig. 4-1. Config. Control Process Activity Model ♦ Fig. 4-2. Govt. ~ Change Initiation Activity Model	– Efficient change processing & orderly communication of change information
♦ Establish CCB using CCB Charter; assign membership, provide operating procedures	4.1.1.3	♦ Fig. 4-4. Govt. ~ Change Eval. & Disposition Activity Model	– Change decisions based on knowledge of change impact
♦ Evaluate contractor configuration control process	4.1.2	♦ Table 4-1. Config.Control Process Eval. Checklist	– Changes limited to those necessary or beneficial
♦ When necessary or beneficial to the Government, initiate requests for Class I ECPs to Functional Baseline configuration documentation and Allocated Baseline configuration documentation for which the Government is the configuration control authority	4.1.1.1, 4.1.1.2, 4.2.1, 4.2.1.1, 4.2.2	♦ Table 4-2. Change Class. ♦ Table 4-3. ECP Just. Codes ♦ Table 4-4 . Class I ECP Types And Their Function ♦ Table 4-5. ECP Priorities ♦ Table 4-6. ECP Content	– Evaluation of cost, savings and tradeoffs facilitated – Consistency between product & documentation – Configuration control preserved at system interfaces
♦ Determine desired change effectivity	4.1.1.4	♦ Table 4-7. ECP Review and Disposition Actions	– Current baselines enable supportability
♦ Coordinate, evaluate and disposition contractor's Class I ECPs and NORs (as applicable)	4.2.1.4, 4.4	♦ Table 4-10, NOR Content	– Deviations are documented and limited
♦ Direct contractual implementation of approved ECPs, in accordance with the approved effectivity, into configuration documentation, System, CIs, and all supporting commodities and services that are effected by the ECP	4.2.1.5	♦ Table 4-8. ECP Implementing Actions	♦ **Risks, if not done:** – Chaotic, ad-hoc change management – Changes approved without knowledge of significant impacts – Changes that are not necessary or offer no benefit – Lack of confidence in cost, schedule estimates – No assurance of product to document consistency – Uncertainty at system interfaces – Inconsistent basis for supportability – No control of deviations – Ineffective program management – Lack of confidence in both Government and contractor process – Essentially, technical anarchy
♦ Review and approve or disapprove contractor requests for deviation from Government approved configuration documents	4.3, 4.3.1, 4.3.2	♦ Table 4-9. RFD Content	
Government/Contractor			
♦ Communicate on status and content of changes and deviation requests contemplated and in process	4.1, 4.2.1.1	♦ Appx G. ECP Mgt. Guide	
Contractor			
♦ Establish Contractor configuration control process and procedures for phase II including CCB, change identification, change evaluation and coordination and approved change implementation and verification	4.1, 4.1.1 4.1.1.3	♦ Fig. 4-1. Config. Control Process Activity Model ♦ Fig. 4-3 Contractor Conf. control Activity Model	
♦ Evaluate sub-contractor configuration control process	4.1.2	♦ Table 4-1 Conf. Control Process Eval. Checklist	
♦ Process proposed changes to approved baseline configuration documentation: – Identify, classify and document change – Evaluate and coordinate change – Assess change impact – Determine proposed effectivity, schedule, and cost	4.1.1, 4.1.1.1 through 4.1.1.4 4.2, 4.2.1, 4.2.1.1 through 4.2.1.4	♦ Table 4-2. Change Class. ♦ Table 4-3. ECP Just. Codes ♦ Table 4-4 . Class I ECP Types And Their Function ♦ Table 4-5. ECP Priorities ♦ Table 4-6. ECP Content ♦ Table 4-7. ECP Review and Disposition Actions	

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Configuration Control, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
– For proposed changes to the Functional Baseline, submit Class I ECPs with attached NORS, if applicable – For proposed changes to an Allocated Baseline • Where the Government is the configuration control authority, submit Class I ECPs with attached NORS, if applicable • Where the contractor is the configuration control authority, obtain a change approval decision from the appropriate organizational level with authority to commit resources to implement the change	4.4, 4.4.1, 4.4.2	♦Table 4-10. NOR Content	
♦For design changes to developmental configuration, assess the change, as part of the release process, to assure that Functional or Allocated Baselines are not impacted ♦Plan change implementation	4.2.1.5 4.2.1.5	♦Table 4-8. ECP Implementing Actions	
♦Implement change and verify re-established consistency of product, documentation operation and maintenance resources	4.3, 4.3.1, 4.3.2	♦Table 4-9. RFD Content	
♦If necessary to depart temporarily from Government approved configuration documents, process and submit Requests for Deviation as required • Classify as major or minor • Document and submit to the configuration control process • Obtain approval decision from the appropriate authority – The Government - if it is a major deviation to a Government approved configuration document (i.e. PRF or DTL Specifications) – The DCMC (or other contractually designated authority) if is a minor deviation to a Government approved configuration document - The appropriate contractor internal authority if the deviation is to contractor baselined configuration documentation			

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Configuration Status Accounting, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government			
♦ Select and tailor data packets of information to be provided by the contractor for Phase III	5.1, 5.2, 5.3	♦ Table 5-1. Typical CSA Information Over the Life Cycle ♦ Table 5-3 CSA Tasks	♦ **Benefit:** – Correct, timely configuration information, when needed to facilitate decision making on changes, deployment of assets, determining applicable replacements, performing updates/upgrades.
♦ Establish procedures and screens for interacting with the Government CM AIS			
♦ Test and assure the integrity of the configuration information in the Government data base(s); verify that CM business rules have been correctly applied		♦ Table 5-2. CSA Process Eval. Checklist	
♦ Evaluate contractor CSA Process	5.3		
Government/Contractor			
♦ Identify the current approved configuration documentation and configuration identifiers associated with each System/CI(s).	5.2, 5.3	♦ Table 5-3. Configuration Status Accounting Tasks ♦ Tables 5-4 Tailoring of MIL-STD-2549 Information Packets	♦ **Risk, if not done** – The risk of inadequate status accounting may result in improper decisions about change effectivity, retrofit requirements, deployment of items requiring support assets that are not in place; all of which contribute to avoidable cost.
♦ Identify the digital data file(s) and document representations of all revisions/versions of each document and software delivered, or made accessible electronically, in support of the contract.			
♦ Record and report the results of configuration audits to include the status and final disposition of identified discrepancies and action items			
♦ Record and report the status of proposed engineering changes from initiation to final approval to contractual implementation			
♦ Record and report the status of all critical and major requests for deviation that affect the configuration of a system/CI(s).			
Contractor			
♦ Capture and report information about: – Product configuration status – Configuration documentation – Current baselines – Historic baselines – Change requests – Change proposals – Change notices – Variances – Warranty data/history – Replacements by maintenance action – Configuration verification and audit status/action item close-out	5.1, 5.2, 5.3	♦ Table 5-1. Typical CSA Information Over the Life Cycle ♦ Table 5-3. Configuration Status Accounting Tasks ♦ Tables 5-4 Tailoring of MIL-STD-2549 Information Packets	
♦ Report the effectivity and installation status of configuration changes to all system/CI(s)			
♦ Provide the traceability of all changes from the original released configuration documentation of each System/CI(s)			
♦ Record and report implementation status of authorized changes		Table 5-2 CSA Process Eval. Checklist	
♦ Evaluate Sub-contractor CSA process	5.3		

Table 2-3. CM Template for Phase II, Engineering and Manufacturing Development, Continued

ACTIVITY: Configuration Audit, Phase II			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Assign Audit co-chair for each audit ♦ Approve audit agenda(s) ♦ Approve minutes ♦ Certify contractors processes for Engineering Release, Configuration Control and Status accounting as adequate to maintain baseline control	6.1, 6.2, 6.2.1, 6.2.2, 6.2.2.1-6.2.2.3	♦ Table 6-1, Audit planning and Pre-Audit Preparation ♦ Table 6-2 Conducting Configuration Audits ♦ Figure 6-3. Audit Certification Package Content	♦ **Benefit:** – Verified configuration and documentation consistent with operational and support requirements – Reliable and dependable baselines ♦ **Risk, of not doing:** – Unnecessary and avoidable support costs – Inaccurate technical manuals – Replacement parts that do not fit – Loss of confidence in supplier.
Government/Contractor ♦ Perform audit planning and pre-audit preparation ♦ Conduct formal audit when required ♦ Review performance requirements, test plans, results, other evidence to determine product performs as specified, warranted & advertised ♦ Perform physical inspection of product and design information; assure accuracy, consistency & conformance with acceptable practice ♦ Record discrepancies; review to close out or determine action; record action items ♦ Track action items to closure via status accounting	6.3	♦ Table 6-1, Audit planning and Pre-Audit Preparation ♦ Table 6-2 Conducting Configuration Audits ♦ Table 6-3. Post Config. Audit Actions/Audit Close-out	
Contractor ♦ Verify product within normal course of process flow ♦ Assure consistency of release information and production/modification information ♦ Assign audit co-chair ♦ Prepare audit agendas ♦ Prepare audit minutes	6.2.1 6.3	♦ Fig. 6-2. Change Implementation and Verification ♦ Table 6-1, Audit Planning and Pre-Audit Preparation ♦ Table 6-2 Conducting Configuration Audits	

Table 2-3A. Operational Definition of Phase II Checklist of CM Actions Metric

Metric Title: Checklist of CM Actions Prior to Major System and CI Development Events		**Process Owner:** Government and Contractor CM Managers	
Description (including Data Source, Measurement Method, Frequency): Program unique checklist to be checked off as actions required prior to applicable events are completed. Actions listed should be consistent with CM planning and program schedules.		**Data Presentation:** See Checklist model below.	
Purpose/Desired Result: The purpose of this metric is to assure that the actions necessary to implement the CM process during the Engineering and Manufacturing Development phase of the program are appropriately planned and completed per schedule.		**Linkage to Objectives:** This metric links to all Phase II CM objectives	
✓	**CONTRACTOR ACTIONS-CHECKLIST**	✓	**GOVERNMENT ACTIONS CHECKLIST**
	List CM Actions to be completed prior to: ♦ Functional Baseline ♦ Allocated baseline(s) ♦ CI Testing ♦ CSCI Testing ♦ Integration Test ♦ First Flight ♦ Operational/Flight Test ♦ Functional Configuration Audit ♦ Physical Configuration Audi *EXAMPLES ONLY*		List CM Actions to be completed prior to: ♦ Functional Baseline ♦ Allocated baseline(s) ♦ GDT&E ♦ Clearance for flight ♦ Functional Configuration Audit ♦ Physical Configuration Audit ♦ OPEVAL ♦ CI Delivery and Acceptance ♦ RFP for Phase III ♦ Phase III Contract Award *EXAMPLES ONLY*

Table 2-3B Operational Definition of ECP Cycle Time Metric

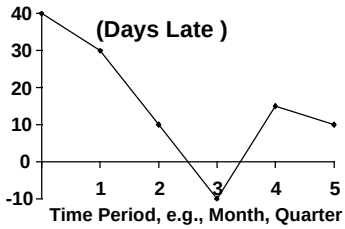
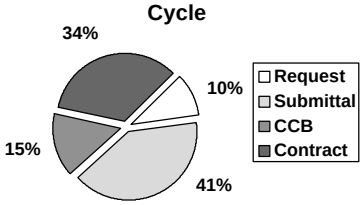
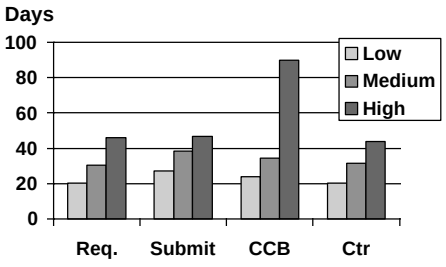
Metric Title: ECP Cycle Time	**Process Owner:** Government CM Manager(G)/ Contractor CM Manager
Description (including Data Source, Measurement Method, Frequency): a. Actual Total (Class I) ECP cycle time compared to targets: • From determination of need until ECP is requested or initiated • ECP request/initiation to submittal • ECP submittal to Govt CCB • CCB approval to Contractual direction/modification This measurement encompasses the entire ECP cycle in terms of the number of calendar days between significant events. Data may be derived completely from information (dates) that is available to the Government CM manager. Typically these data are compiled monthly. Targets that the data are compared derive from averaging the scheduled periods for each ECP. b. Actual Contractor ECP cycle time between major process milestones, compared to targets, e.g., • Request • IPT Technical definition complete • Estimating and Pricing complete • CCB • Submittal This measurement encompasses the contractor portion of the ECP cycle in terms of the number of calendar days between significant milestones in the process. (Each contractor process may vary.) c. Actual Government cycle time (after contractor submits ECP) between major milestones, compared to targets, e.g. • Receipt • Staffing & Evaluation complete • CCB • Contractual authorization This measurement encompasses the Government portion of the ECP cycle in terms of the number of calendar days between significant milestones in the process.	**Data Presentation:** a. Data are typically presented as (1)a plot of average time variance from scheduled time, (2) a pie chart showing percentage of time spent in portions of the cycle, or (3) bar charts showing portions contributing to lateness. This data may be stratified by ECP $ value, complexity factors, ECP Priority codes, or ECP Justification codes to determine the influence of such factors on processing time. **Average Variance from Schedule**  (1) **Percentage of Time in Portions of Cycle**  (2) **Portions of Process Contribution to Lateness (Stratified by $ Value)**  (3) b. & c.. Data presentation similar to a.
Purpose/Desired Result: Shows the total time spent in the ECP Cycle including both Government and Contractor Activity . It shows which portions of the ECP cycle are the longest, focuses attention on ECP processing, and highlights areas of inefficient process or insufficient priority. It also isolates contributing factors and constraints, concentrates improvement effort where it will benefit the entire process, and shows the effectiveness of improvements measured over time.	**Linkage to Objectives:** This metric links to the common Government and Contractor objective to provide efficient and timely processing of ECPs and Requests for Deviations.

Table 2-3C Operational Definition of ECP Approval Rate Metric

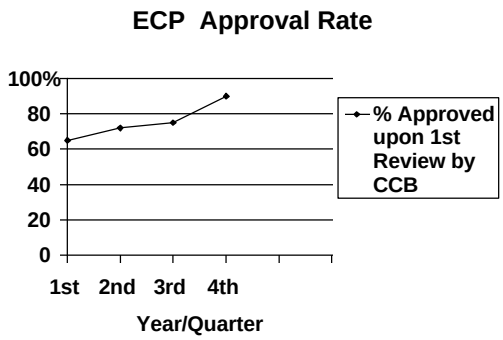
Metric Title: ECP Approval Rate	**Process Owner:** Government and Contractor CM Managers (Jointly and Separately)
Description (including Data Source, Measurement Method, Frequency): This metric applies only to Class I ECPs. To obtain a measure of the rate of first pass approvals in any time period, count the number of ECPs that are approved upon first submittal to a CCB, and divide by the total number submitted. Do not count ECPs that are revised and resubmitted as first pass approvals. Average the results over time. The same process can be applied to contractor's internal CCB, and to the Governments CCB. The former measures the internal approval rate and the latter, the approval rate by the Government. Data for this metric should be available from status accounting records relating to CCB scheduling and processing of ECPs. Monthly or Quarterly compilation is typical, depending upon change volume. Additionally, the rate of disapproval may be measured by dividing the total disapproved in a time period by the total submitted.	**Data Presentation:** 
Purpose/Desired Result: The purpose of this metric is to highlight the degree of, or lack of coordination between customer (the Government) and supplier (the Contractor) of ECPs. Typically a low approval/high rejection rate indicates that there has been insufficient agreement on the scope and nature of the proposed change prior to the initiation of the request for ECP, or the initiation of the proposal. The desired result is improved communications leading to a significant reduction in the number and associated processing cost of ECPs that are disapproved or require rework to make them successful.	**Linkage to Objectives:** This metric links to the common Government and Contractor objective to provide efficient and timely processing of ECPs and Requests for Deviations.

Table 2-3D Operational Definition of Deviation Performance Metric

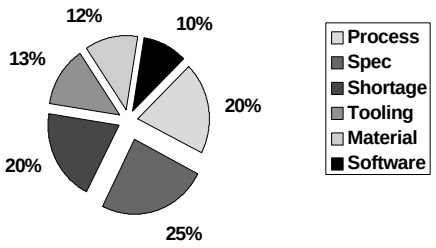
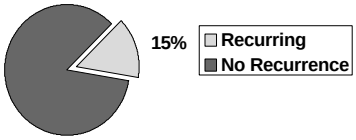
Metric Title: Number of Deviation Requests and Percentage Recurring	**Process Owner:** Contractor CM Manager/DCMC
Description (including Data Source, Measurement Method, Frequency): To measure the volume of deviation requests, count the number of deviation requests in each reporting period. Categorize and stratify the data by reasons for the deviation request in order to identify the most frequent causes. Count the number of times that a deviation recurs (i.e. the same variance is requested for a second or third range of end items as was previously requested).	**Data Presentation:** **Deviations by Root Cause**  **Percent Deviations Recurring One time or More** 
Purpose/Desired Result: The purpose of this metric is to determine and isolate the causes of excessive and recurring deviation requests. The desired result is to determine the process steps or technical area contributing the most to the number of deviations and to the recurrence of deviations so that appropriate corrective action or process improvement can be effected. This metric may also be used by the Government to assess Contractor performance.	**Linkage to Objectives:** This metric links to the common Government and Contractor objective to provide efficient and timely processing of ECPs and Requests for Deviations and Waivers.

Table 2-3E Operational Definition of Configuration Audit Metric

Metric Title: Number of Configuration Audits/ Open Actions	**Process Owner:** Government and Contractor CM Managers (Jointly)
Description (including Data Source, Measurement Method, Frequency): This metric measures the number of scheduled, performed and completed configuration audits during the current phase of the program life cycle. It also measures the completeness and speed of follow-up action required to completely close out each audit.	**Data Presentation:** (Tabular) **CI** *CI Ident* — **AUDIT TYPE** *(FCA PCA)* — **DATE** *Sched, Actual, Date* — **STATUS** *Open Compl etc.* — **RESP** *Actionee* — **REQD ACTIONS** *Action Descrip'n* — **DAYS OPEN** *#Days Since Audit* **SUMMARY**: *# Open* _____ *(Avg.)** _____ *Plot trend by audit type, contractor, etc. as applicable
Purpose/Desired Result: The purpose of this metric is to highlight the importance of • verifying that the fuctional and physical requirements have been met • the documentation matches the product • the product baseline configuration is being maintaining, and, concurrently that: • Audit participants are completing assigned actions necessary to bring the audits to a satisfactory closure	**Linkage to Objectives:** This metric links to the Government and contractor objectives: • Documented performance achieved and verified • Joint Functional Configuration Audit completed per plan • Defined and verified product configuration • assurance that contractor(s) has established and is maintaining a Product Baseline for each CI and that there is a known configuration of all CIs in the operational inventory. (Note: This metric is common to both Phase II and Phase III)

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support

CM Objectives	Typical Metrics
Government ♦ Assurance that contractor(s) has established and maintains a Product Baseline for CIs for which contractor is configuration control authority for the detail design. ♦ Establish Product Baseline for CIs for which Government is configuration control authority for the detail design ♦ Known configuration of all CIs in operational inventory (down to lowest organically replaceable parts) ♦ Present and planned allocation of CI assets by S/N to operational sites, squadrons, wings, corps, etc. ♦ Access to operation and maintenance information for the current configuration (down to the lowest organically replaceable parts) of each deployed CI or CSCI version; knowledge as to approved ECPs incorporated ♦ Reference to correct configuration of support assets (support equipment, test program sets, trainers and associated software) required for each operational configuration of each CI to the extent that it is organically supported. ♦ Ability to determine the current mission capability of each CI S/N reflected by installed software version, ECP (& modification kit) incorporation, and local insertion of mission data. ♦ Known configuration, (quantities and location) of spare and replacement parts for current configuration, and mod kits to upgrade to new (baseline) configuration ♦ Access to design disclosure data for spare parts to be re-procured to detailed design rather than performance data. **Both Government and Contractor(s)** ♦ Current Functional and Allocated Baseline(s) reflecting performance specification and the revision applicable to each CI effectivity range (block) or CSCI version ♦ Efficient, timely processing of ECPs and Requests for Deviation. ♦ Approved Class I ECP implementing actions scheduled and completed **Contractor(s)** ♦ Fully documented design and product configuration ♦ Verified as designed/as built configuration of each delivered CI and CSCI version including applicable and re-creatable documentation revisions ♦ Approved Deviations documenting all as-designed and as-built variances ♦ Traceability of Serial/lot numbered CIs and component parts ♦ Verified incorporation of approved ECPs into CI production effectivity; and validated retrofit kit deliveries to satisfy retrofit effectivity ♦ Reference to the correct configuration of support assets (support equipment, test program sets, trainers, manuals and associated software) required to maintain each operational configuration of each CI that is contractor supported.	♦ Checklist of actions to be completed prior to significant phase III events. **[See Table 2-4A.]** ♦ ECP Cycle time (may be stratified by $ value or complexity factors, ECP Priority codes and ECP Justification codes) **[See Phase II, Table 2-3B for metric operational definition of metric.]** ♦ Rate of Class I ECP Approval **[See Phase II, Table 2-3C for operational definition of metric.]** • Contractor CCB • Government CCB ♦ Number of Deviation Requests & % Recurring **[See Phase II, Table 2-3D for operational definition of metric.]** ♦ Number of Configuration Audits planned, held, successfully completed (all actions); Open actions remaining per audit. **[See Phase II, Table 2-3E for operational definition of metric.]** ♦ Volume of un-incorporated (unverified) engineering changes vs target (stratified by class and CI). **[See Table 2-4B for operational definition of metric.]** ♦ Number of approved ECP implementing actions completed vs schedule (stratified by type, priority, and responsibility). **[See Table 2-4C for operational definition of metric.]**

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Management and Planning, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Prepare, coordinate and release procedures implementing Phase III Government CM Process; conduct training. (See Govt configuration identification, control, status accounting, and audit activities below.) ♦ Measure/Evaluate Contractor CM Process	2.3.2 2.3.3, 3.1.2,	♦ Table 3-1. Config. Ident. Process Eval. Checklist ♦ Table 4-1. Config. Ctrl. Process Eval. Checklist ♦ Table 5-2. CSA Process Eval. Checklist ♦ Table A-2 Govt CM Plan	♦ **Benefit:** - The appropriate level of resources and the right information to efficiently and effectively conduct CM throughout Phase III ♦ **Risks, if not done:** – Inadequate resources to accomplish essential tasks late in program – Poor supportability at a time of aging assets
Contractor and Government ♦ Update CM Planning, as required, to reflect process improvements, new deployment information, changes in support/maintenance planning, major modifications, etc. ♦ Plan for end of production, demilitarization and disposal.	2.2.3, 2.3.1 - 2.3.4 Appx A, 5.2, 5.3, Sect. 7	♦ Table A-3 Contractor CMP ♦ Anticipate CM services required after production ♦ Consider CM information needs after production; upon demil/disposal • Is sustainment data sufficient? • Verify environmental constraints	
Contractor ♦ Prepare, coordinate and release procedures to implement the contractor CM Process for Phase III; conduct necessary training. (See contractor configuration identification, control, status accounting, and audit activities below.) ♦ Measure/evaluate sub-contractor CM Process	1.1, 1.3.1, 2.2.2, 2.2.3, EIA 649	♦ Tables 3-1, 4-1, 5-2 (See above)	

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Configuration Identification, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Perform basic Configuration Identification actions defined in Phase II, for documentation, hardware and software created or revised as a result of approved engineering changes. ♦ Where the Government is the design activity, authorize release of documents and document revisions ♦ Maintain current Functional baseline, and Government Allocated Baselines ♦ For CIs for which Government is configuration control authority at the detail design level, maintain a (Government) Product Baseline ♦ Assign Government Nomenclature, where appropriate **Contractor and Government** ♦ If maintenance plan is affected by a change, make sure that level of performance specification for the new configuration remains consistent with revised maintenance planning **Contractor** ♦ Perform basic Configuration Identification actions defined in Phase II, for documentation, hardware and software created or revised as a result of approved engineering changes, i.e., • Assign CI, document, part/item and software identifiers, • Revise interfaces using ICWGs/ICDs as applicable • Prepare and coordinate CI specification /revisions • Approve CI (PRF and/or DTL) specification/revision for CIs for which contractor has configuration control authority, establishing a new current (Contractor) Allocated Baseline • Track traceable items via serial number or lot number • Release engineering design data (Engineering drawings, computer models, software design documents) • Maintain design release (release record) • For CIs for which the contractor is configuration control authority for detail design, maintain (Contractor) Product Baseline	3.4.1, 3.4.2, 3.5.1, 3.5.2 3.2, 3.2.1, 3.3, 3.3.1, 3.3.2 3.6, 3.6.1-3.6.4 3.8, 3.8.1, 3.8.2 3.4, 3.4.1, 3.4.2 3.5, 3.5.1, 3.5.2 4.1.1.1 3.6.3 3.7, 3.7.1, 3.7.2 3..5, 3.5.1, 3.5.2, 4.1.1.1 6.1, 6.2, 6.2.1	♦ Table 3-2. CI Select. Crit. ♦ Fig. 3-3. Selection. of. Specification Types ♦ Table 3-3. Order of Precedence for Specs. ♦ Table 3-4. Spec.Types Categorized by Source ♦ Table 3-5. Spec. Types Categorized by Utility ♦ Table 3-6 Spec. Types Categorized by Object ♦ Table 3-7. Spec. Types Categorized by Purpose ♦ Table 3-13 Govt Acq. of Detailed design Data ♦ Table 3-11. Item Ident. ♦ Table 3-14. Doc. Defining Interfaces ♦ Table 3-15. Interface Mgmt. Process Matrix ♦ Fig. 3-6. Interface Mgmt. Process Flow	♦ **Benefit:** – Performance, interface and other attributes are clearly documented and used as basis for configuration control – Items are appropriately identified and marked – Re-identification occurs as significant changes are incorporated – Release controls and configuration baselines are maintained – Users and maintenance personnel can locate information correlated to correct product versions ♦ **Risks, if not done:** – Inability to provide efficient product support after production and deployment – Inadequate or incorrect product identification and marking resulting in incorrect replacement parts – Inability to distinguish between product versions resulting in deployment of assets requiring excessive support capability and assets without the functional capability needed for assigned missions – Inadequate basis for defining changes and corrective actions – Uncertain, wasteful and costly configuration control decisions

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Configuration Control, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government			
♦ Establish Government configuration control procedures for phase III, including change Initiation and CCB operating procedures for change evaluation and disposition.	4.1, 4.1.1, 4.1.1.1-4.1.1.4	♦ Fig. 4-1. Config. Control Process Activity Model ♦ Fig. 4-2. Govt. ~ Change Initiation Activity Model ♦ Fig. 4-4. Govt. ~ Change Eval. & Disposition Activity Model	♦ **Benefits:** – Efficient change processing & orderly communication of change information – Change decisions based on knowledge of change impact – Changes limited to those necessary or beneficial – Evaluation of cost, savings and tradeoffs facilitated – Consistency between product and documentation – Configuration control preserved at system interfaces – Current baselines enable supportability – Deviations are documented and limited
♦ Evaluate contractor configuration control process	4.1.2	♦ Table 4-1. Config Control Process Eval. Checklist	
♦ Identify need for changes requested by Government activities, and when necessary or beneficial to the Government initiate requests for Class I ECPs; determine desired effectivity of requested change	4.1.1.1, 4.1.1.2, 4.2.1, 4.2.1.1 4.2.2	♦ Table 4-2. Change Classification ♦ Table 4-3. ECP Justification Codes ♦ Table 4-4. Class I ECP Types And Their Function	
♦ Coordinate, evaluate and disposition contractor's Class I ECPs with attached NORs, as applicable	4.1.1.4 4.2.1.4, 4.4	♦ Table 4-5. ECP Priorities ♦ Table 4-6. ECP Content ♦ Table 4-10, NOR Content ♦ Table 4-7. ECP Review and Disposition Actions	
♦ Direct contractual implementation of approved ECPs, in accordance with the approved effectivity, into configuration documentation, System, CIs, and all supporting commodities and services that are effected by the ECP	4.2.1.5	♦ Table 4-8. ECP Implementing Actions	
♦ Review and approve or disapprove contractor requests for deviation from Government approved configuration documents	4.3, 4.3.1, 4.3.2	♦ Table 4-9. RFD Content	♦ **Risks, if not done:** – Chaotic, ad-hoc change management – Changes approved without knowledge of significant impacts – Changes that are not necessary or offer no benefit – Lack of confidence in accurate cost, schedule estimates – No assurance of product to document consistency – Uncertainty at system interfaces – Inconsistent basis for supportability – No control of deviations – Ineffective Program
♦ Document local engineering changes and assure that they do not impact current baselines, prior to approving their implementation. Request contractor review when necessary.	4.1.1, 4.1.1.1		
Government/Contractor			
♦ Communicate on status and content of changes and deviation requests contemplated and in process	4.1, 4.2.1.1,	♦ Appendix G	
Contractor			
♦ Establish Contractor configuration control process and procedures for phase III including change identification, change evaluation and coordination and approved change implementation and verification	4.1, 4.1.1	♦ Fig. 4-1.Config. Control Process Activity Model Fig. 4-3. Contractor Config.Control Activity Model	

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Configuration Control, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
♦ Evaluate sub-contractor configuration control process	4.1.2	♦ Table 4-1. Configuration control Process Evaluation Checklist	Management – Lack of confidence in both government and Contractor Process – Essentially, technical anarchy
♦ Process proposed changes to approved baseline configuration documentation: • Identify, classify and document change • Evaluate and coordinate change • Assess change impact • Determine proposed effectivity, schedule and cost • For proposed changes to the Functional Baseline, submit Class I ECPs • For proposed changes to an Allocated or Product Baseline - Where the Government is the configuration control authority, submit Class I ECPs with attached NORS, if applicable - Where the contractor is the configuration control authority, obtain a change approval decision from the appropriate organizational level with authority to commit resources to implement the change	4.1.1, 4.1.1.1 through 4.1.1.4 4.2, 4.2.1, 4.2.1.1 through 4.2.1.4 4.4, 4.4.1, 4.4.2	♦ Table 4-2. Change Classification ♦ Table 4-3. ECP Justification Codes ♦ Table 4-4. Class I ECP Types And Their Function ♦ Table 4-5. ECP Priorities ♦ Table 4-6. ECP Content ♦ Table 4-10, NOR Content ♦ Table 4-7. ECP Review and Disposition Actions	
♦ Plan change implementation ♦ Implement change and verify re-established consistency of product, documentation, operation and maintenance resources	4.2.1.5 4.2.1.5	♦ Table 4-8. ECP Implementing Actions	
♦ If necessary to depart temporarily from Government approved configuration documents, process and submit Requests for Deviation as required • Classify as major or minor • Document and submit to the configuration control process • Obtain approval decision from the appropriate authority – The Government if it is a major deviation to a Government approved configuration document – The DCMC (or other contractually designated authority) if is a minor deviation to a Government approved configuration document – The appropriate contractor internal authority if the deviation is to contractor baselined configuration documentation	4.3, 4.3.1, 4.3.2	♦ Table 4-9. RFD Content	

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Configuration Status Accounting, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Establish procedures and screens for interacting with the Government CM AIS ♦ Test and assure the integrity of the configuration information in the Government data base(s); verify that CM business rules have been correctly applied ♦ Evaluate Contractor CSA Process **Government/Contractor (Based on contractual division of responsibility)** ♦ Identify the current approved configuration documentation and configuration identifiers associated with each System/CI(s). ♦ Identify the digital data file(s) and document representations of all revisions/versions of each document and software delivered, or made accessible electronically, in support of the contract. ♦ Record and report the results of configuration audits to include the status and final disposition of identified discrepancies and action items ♦ Record and report the status of proposed engineering changes from initiation to final approval to contractual implementation ♦ Record and report the status of all critical and major requests for deviation that affect the configuration of a system/CI(s). ♦ Report the effectivity and installation status of configuration changes to all system/CI(s) ♦ Provide the traceability of all changes from the original released configuration documentation of each System/CI(s) ♦ Record and report configuration changes resulting from retrofit and by replacements through maintenance action ♦ Retain information about: – Product configuration status – Configuration documentation – Current baselines – Historic baselines – Change requests – Change proposals – Change notices – Deviations – Warranty data/history – Configuration verification and audit status/action item close-out	5.1, 5.2, 5.3 5.3 5.2, 5.3	♦ Table 5-1. Typical CSA Information Over the Life Cycle ♦ Table 5-3. CSA Tasks ♦ Table 5-2. CSA Process Evaluation Checklist ♦ Table 5-3. CSA Tasks ♦ Table 5-4. Tailoring of MIL-STD-2549 Information Packets	♦ **Benefit:** – Correct, timely configuration information, when needed to facilitate decision making on changes, deployment of assets, determining applicable replacements, performing updates/upgrades. ♦ **Risk, if not done** – The risk of inadequate status accounting may result in improper decisions about change effectivity, retrofit requirements, deployment of items requiring support assets that are not in place; all of which contribute to avoidable cost.

Table 2-4. CM Template for Phase III, Production, Fielding/ Deployment and Operational Support, Continued

ACTIVITY: Configuration Status Accounting, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Contractor ♦ Evaluate Sub-contractor CSA Process	5.3	♦ Table 5-2. CSA Process Evaluation Checklist	

ACTIVITY: Configuration Audit, Phase III			
Actions:	**Ref:**	**Decisions/Criteria**	**Benefits/Risks**
Government ♦ Assign Audit co-chair for each audit ♦ Approve audit agenda(s) ♦ Approve minutes ♦ Certify contractors processes for Engineering Release, Configuration Control and Status accounting as adequate to maintain baseline control	6.1, 6.2, 6.2.1, 6.2.2, 6.2.2.1-6.2.2.3	♦ Table 6-1, Audit Planning and Pre-Audit Preparation ♦ Table 6-2 Conducting Configuration Audits ♦ Figure 6-3. Audit Certification Package Content	♦ **Benefit:** - Verified configuration and documentation consistent with operational and support requirements - Reliable and dependable baselines
Government/Contractor ♦ Conduct formal audit when required ♦ Review performance requirements, test plans, results, other evidence to determine product performs as specified, warranted & advertised ♦ Perform physical inspection of product and design information; assure accuracy, consistency & conformance with acceptable practice ♦ Record discrepancies; review to close out or determine action; record action items ♦ Track action items to closure via status accounting	6.3	♦ Table 6-2 Conducting Configuration Audits ♦ Figure 6-3. Audit Certification Package Content ♦ Table 6-3. Post Config. Audit Actions/Audit Close-out	♦ **Risk, of not doing:** - Unnecessary and avoidable support costs - Inaccurate technical manuals - Replacement parts that do not fit - Loss of confidence in supplier.
Contractor ♦ Verify product within normal course of process flow ♦ Assure consistency of release information and production/modification information ♦ Assign audit co-chair ♦ Prepare audit agendas ♦ Prepare audit minutes	6.2.1 6.3	♦ Fig. 6-2. Change Implementation and Verification ♦ Table 6-1, Audit Planning and Pre-Audit Preparation ♦ Table 6-2 Conducting Configuration Audits	

Table 2-4A. Operational Definition of Phase III Checklist of CM Actions Metric

Metric Title: Checklist of CM Actions Prior to Major Phase III Events		**Process Owner:** Government and Contractor CM Managers	
Description (including Data Source, Measurement Method, Frequency): Program unique checklist to be checked off as actions required prior to applicable events are completed. Actions listed should be consistent with CM planning and program schedules.		**Data Presentation:** See Checklist model below.	
Purpose/Desired Result: The purpose of this metric is to assure that the actions necessary to implement the CM process during the Production, Fielding/Deployment and Operational Support phase of the program are appropriately planned and completed per schedule.		**Linkage to Objectives:** This metric links to all Phase III CM objectives	
✓	**CONTRACTOR ACTIONS-CHECKLIST**	✓	**GOVERNMENT ACTIONS CHECKLIST**
	List CM Actions to be completed prior to: • First Production system or CI Delivery • First Delivery each new production block or lot • Release of each new software version • Retrofit kit delivery • Upon receipt of a CI for repair • Change to maintenance and repair procedures • End of subcontractor production • End of Contractor production • End of contractor operational support • Delivery of Technical Data Package *EXAMPLES ONLY*		List CM Actions to be completed prior to: • Acceptance of first production unit • Acceptance of all production units • First fielding/deployment • Major modification/overhaul • Retrofit Kit Acceptance • Fiscal year contract • Return of CI to supplier for repair • End of Production • Demilitarization and Disposal *EXAMPLES ONLY*

Table 2-4B Operational Definition of Change Incorporation Rate Metric

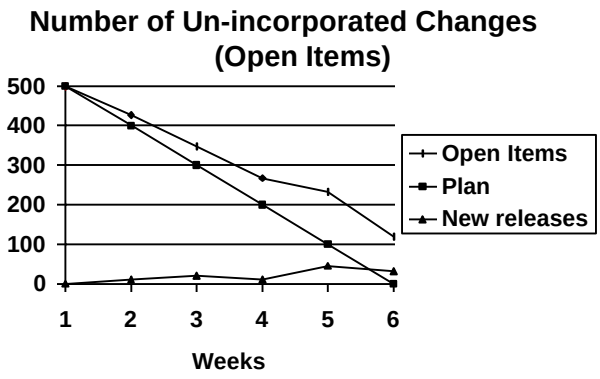
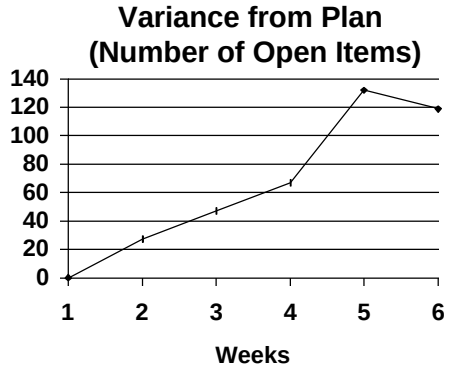
Metric Title: Change Incorporation Rate (Volume of Un-incorporated/unverified Engineering Changes)	**Process Owner:** Production Contractor or Government Rework Facility
Description (including Data Source, Measurement Method, Frequency): This metric measures the detailed change activity to be accomplished prior to delivery of each CI versus a predicted/expected rate of incorporation. It shows the rate of new changes being released and the rate that changes are being verified as completed. History compiled from successive deliveries is used to refine the slope of the expected rate. The source of information for this metric is the in-process as-designed vs as-built system used in production. Data are compiled from counts of the released but not verified changes over time. Typically data are plotted weekly. This metric may be stratified by CI, Class and responsibility for incorporation.	**Data Presentation:**  
Purpose/Desired Result: The purpose of this metric is to assess the readiness for delivery of each production CI. This metric is used most often where there is significant configuration change between successive CIs being produced or being prepared (refurbished) for delivery. The desired result from this metric is a predictable completion date and an early warning of possible delay due to rates of completion that are out of the expected range. Indirectly this metric provides an indication that incorporated changes are being verified and therefore the as-built configuration of the CI will be known.	**Linkage to Objectives:** This metric links to the Government objective of assurance that contractor(s) has established and is maintaining a Product Baseline for each CI and that there is a known configuration of all CIs in the operational inventory.

Table 2-4C Operational Definition of Class I ECP Implementing Action Metric

Metric Title: Completion of Class I ECP Implementing Actions

Process Owner: Government and Contractor CM managers

Description (including Data Source, Measurement Method, Frequency):

This metric measures the specific post ECP actions* completed vs schedule (stratified by type and priority) for each approved Class I ECP and collectively for all Class I ECPs. It relates to both Government and contractor actions. Information for this metric comes initially from the ECP itself in the form of the commodities impacted by the ECP and the ECP implementation schedule. It is augmented by the detailed planning for ECP incorporation, and by the results of update of logistics plans.

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*(regarding Contracting, ordering, production incorporation, mod kit ordering, retrofit incorporation, support equipment, pubs update/delivery, spares, trainers and training, etc.)

Data Presentation: (Tabular)

a. Summary:

	---------- ACTIONS----------		
ECP. No.	**TOTAL**	**DUE PER SCHED**	**#DUE & OPEN**
4326	*14*	*10*	*2*
7894	*6*	*6*	*2*
Total # of ECPs =2	*20*	*16 (80%)*	*4 (25%)*

(Plot trend)

b. Detail List:

ECP No.	**ACTION**	**RESPONS**	**SCHED**	**STATUS**
4326	*(List by CI SE Pubs etc.*	*Commodity)*	*Date*	*Open or Date Completed*

Purpose/Desired Result:

The purpose of this metric is to focus attention on the many detailed actions that must be completed over time to completely implement an ECP in all areas that are impacted by the ECP. This metric reflects the degree of communication between Government and Contractor and also the extent of the team effort required to successfully manage the post ECP approval process. The data on actions relating to each ECP assure effective tracking of completion actions, while the collective data indicate trends that may be used to effect corrective or improvement action by the Government or contractors, as necessary. The desired result is that sufficient attention is afforded to this critical activity to ensure that the Governments configuration management objectives in support of the operational forces are effectively achieved.

Linkage to Objectives:

This metric links to the following CM objectives:

- Current Functional and Allocated Baseline(s) reflecting performance specification and the revision applicable to each CI effectivity range (block) or CSCI version
- Known configuration of all CIs in operational inventory
- Access to validated revision of operation and maintenance manuals for the current configuration of each deployed CI S/N or CSCI version; knowledge as to which revision incorporates each approved ECP that impacted the manual
- Ability to determine the current mission capability of each CI S/N reflected by installed software version, ECP (& modification kit) incorporation, and local insertion of mission data.
- Known configuration, (quantities and location) of spare and replacement parts to maintain current configuration; and modification kits to upgrade to new (baseline) configuration
- Access to design disclosure data for spare parts to be re-procured to detailed design rather than performance data.
- Verified incorporation of approved ECPs in prescribed CI production effectivity; validated retrofit kit deliveries for retrofit effectivity.